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U.S.-JAPAN COMPETITION IN CONSTRUCTION EQUIPMENT

SUMMARY

The $10-billion U.S. construction equipment industry is currently mired in its worst recession in at least a quarter-century, with few signs of recovery on the horizon. Domestic demand for bulldozers, loaders, excavators, scrapers, cranes and other types of construction equipment for use in building construction, civil engineering and surface mining has plunged. Exports, which have traditionally cushioned drops in U.S. sales, have contracted sharply as well. The American industry's problems are compounded by increasingly stiff competition from Japanese makers, particularly Komatsu, Ltd., second only to world leader Caterpillar Tractor Co. in earthmoving equipment. Like their U.S. counterparts, Japan's construction equipment manufacturers are saddled with a depressed home market that is not expected to turn around in the near future. They have therefore set their sights on capturing a larger share of international trade, traditionally the province of American companies. The losers in the U.S.-Japan battle for market share are likely to be financially strapped second-tier American producers, but the winners are expected to include Caterpillar as well as Komatsu.

Japan's Industry Comes of Age

Under mounting pressure in the early 1960s to open the manufacturing sector to foreign capital investment, the Japanese government opted to buy time for promising industries like motor vehicles and electronics by allowing foreign manufacturers to move into the fledgling constructin equipment industry. Caterpillar Tractor Co. — then, as now, the indisputable world champion in earthmoving and construction equipment — quickly took advantage of the opening. In 1963, it teamed up with Mitsubishi Heavy Industries, Ltd., a diversified heavy-equipment maker and the number-two Japanese constructin equipment builder at the time, and formed equally owned Caterpillar Mitsubishi Ltd. to manufacture Caterpillar-iicensed earthmoving equipment and market products imported from the American parent.

Afraid of being crushed in their own backyard by the industry giant, many of Japan's constructin equipment producers scrambled to acquire product and process technologies from American and European manufacturers. Top maker Komatsu, Ltd. tied up first with Bucyrus-Erie Co. to manufacture excavators based on the Milwaukee, Wisconsin firm's technology and then with International Harvester Co. to turn out small front-end wheel loaders under license. Kobe Steel, Ltd. bought constructin equipment licenses from three firms: Wisconsin-based Harnischfeger Corp. (mechanical and

hydraulic cranes), West Germany's Liebherr-Hydrauliebagger GmbH (hydraulic excavators) and Fiat S.p.A. of Italy (front-end wheel loaders). Ishikawajima-Harima Heavy Industries Co., Ltd. signed an agreement with Koehring Co. of Milwaukee, Wisconsin to produce hydraulic excavators and cranes under license, while Sumitomo Heavy Indusfries, Ltd., another diversified heavy-equipment manufacturer, acquired Chicago-based FMC Corp.'s hydraulic-excavator and crane technology. Hydraulic-excavator technology was purchased as well by Japan Steel Works, Ltd. (Orenstein und Koppel AG of West Germany), Yutani Heavy Industries, Ltd. (Porclain S.A. of France) and Mitsubishi Heavy Industries (France's Yumbo S.A.).

Armed with imported technologies and an increasing body of domestically developed know-how, Japan's constructin equipment manufacturers were able to capitalize on the boom in civil engineering and construction work that occurred during the high-growth 1960s and early 1970s. Large public-works projects like highway, bridge and railroad construction solidified the position of bulldozers as the industry's premier piece of equipment and, in the process, bolstered the fortunes of Komatsu, the dominant maker of this product. The proliferation of smaller public-works projects, such as the construction of streets and water and sewer systems, and the growing number of residential construction starts gave the output of hydraulic and mechanical excavators a major boost, as well as helped to expand the production of wheel and crawler (tracklaying) loaders. Moreover, with many new factories, offices and other commercial buildings, schools and hospitals under construction, the output of truck-mounted cranes went up.

The 1973-74 oil crisis and the ensuing recession in Japan brought an end to the fast-paced pulled expansion of the domestic constructin equipment industry. Large civil-engineering projects slowed to a trickle and even smaller public-works projects were pared back, while private residential and nonresidential construction starts dropped. As a result, production of bulldozers, excavators, loaders, cranes and other types of construction equipment marked time from 1973 through most of 1977.

The government's pump-priming supplementary FY 1977 and original FY 1978 budgets gave the constructin equipment industry the boost it needed to get over the slump. The value of new work contracted by the national government as well as by prefectural and local governments jumped by over one-fourth in 1977 and remained at the same high level the next year, with roads, schools and hospitals, water and sewer systems and erosion and flood control receiving particularly large appropriation increases. But the recovery in production was uneven, partly because public-works spending was skewed toward small and medium-sized projects and partly because new housing starts, which had expanded sharply in 1976, leveled off in the 1977-78 period and private nonresidential construction remained in the doldrums. The upshot was that hydraulic excavators replaced bulldozers in 1977 as the Japanese industry's top production item, while crane production stagnated and output of more maneuverable wheel loaders expanded at the expense of crawler loaders.

The rebound in domestic demand for construction equipment was not only uneven but also short-lived. Concerned about mounting budget deficits, government at all levels began to apply the brakes to public-works spending in FY 1979 and FY 1980; as a result, the value of public construction started in those two years did not increase by much more than the inflation rate. Moreover, residential construction starts slipped in 1979 and then fell 15 percent the following year. Some increase in industrial and commercial building took up part of the slack from other sectors, but did little to change the overall picture of sluggish new domestic orders for construction equipment.

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With domestic demand faltering, Japanese constructin equipment makers started to zero in on export sales. Overseas shipments were relatively unimportant to the industry during the high-growth years of the 1960s and early 1970s, but after the first oil crisis manufacturers began to pursue exports more systematically. During the mid-1970s, in fact, exports kept the industry afloat, especially bulldozer/crawler tractor producers, which shipped as much as half of their output abroad during this period. The 1977-78 upsurge in domestic orders again took the pressure off export sales, but the reprieve was only temporary for expansion-minded manufacturers.

In trying to expand their export business, many Japanese manufacturers, particularly hydraulic-excavator builders, quickly ran into what they considered to be major roadblocks: the restrictions foreign constructin equipment companies had placed on exports by their Japanese technology licensees and/or sales partners. Under the licensing agreements signed in the early 1960s, Japanese producers could not export products based on imported technology to specified foreign markets, usually including the United States. Some technology contracts also gave the foreign company veto power over the development and introduction of competing products by its Japanese licensee. The sales agreements generally prevented Japanese makers from exporting on their own.

Japanese manufacturers maintained that the licensing agreements had outlived their usefulness since they had independently developed and honed product and process technologies that were at least equal to foreign know-how, if not superior. Producers with licensing contracts also found themselves at a competitive disadvantage not only vis-a-vis American and European makers but also in relation to Japanese manufacturers like Hitachi Construction Machinery Co., Ltd. (hydraulic excavators) and Furukawa Co., Ltd. (wheel loaders) that had steered clear of foreign technology and emerged as Japan's top exporters in their product line.

Backed by Japan's Fair Trade Commission, which concluded in 1979 that contracts restricting exports or the development of competing products violated the country's antimonopoly laws, construction equipment manufacturers set out to gain a free hand in production and exports by dissolving or at least revising their agreements. Mitsubishi Heavy Industries and Caterpillar modified their licensing agreement in 1979 to allow the Japanese maker to turn out any product that does not compete head-to-head with Caterpillar products. In the messiest breakup, Komatsu and Bucyrus-Erie terminated their hydraulic-excavator joint venture in early 1981; a year later, Komatsu acquired International Harvester's stake in their joint wheel-loader business after the American firm started selling off some of its assets. Kobe Steel canceled the technology contracts with its two European licensors during the 1979-80 period, and last year it bought out its contract with Harnischfeger. In addition, Japan Steel Works, Yutani Heavy Industries and Mitsubishi Heavy Industries ended their hydraulic-excavator technology agreements, while Ishikawajima-Harima Heavy Industries and Koehring terminated their technical-licensing and sales agreement in 1980, five years after they dissolved their production tie-up. Only Sumitomo Heavy Industries and FMC maintain a basically unchanged relationship, although the Japanese firm is pushing for some modifications in the arrangement.

Mature U.S. Industry Banks on Exports

American construction equipment companies that had licensed technology to Japanese manufacturers were generally reluctant to terminate the contracts. The potential loss of royalty income figured into this unwillingness, as did the prospect of forfeiting a low-cost source of supply for certain products and giving up a low-risk means of maintaining a presence in the Japanese market. Far more important, though, U.S. builders did not want to unleash new Japanese competition for sales in third markets at a time when the traditional importance of exports to the financial health of American makers was being heightened by a slide in domestic demand.

In the United States, just as in Japan, demand for most types of construction equipment peaked in 1978 or 1979. Sales of the small and medium-sized machines contractors use for excavation and construction of water and sewer lines and new roads in housing developments -- backhoes, graders, wheel loaders and bulldozers -- were strong in both 1977 and 1978, buoyed by the high level of residential construction starts in those two years. But demand stalled in 1979 when housing activity leveled off and then plunged as housing starts went into a skid and tumbled in 1981 to their lowest level since 1946.

A 1979 upturn in commercial and industrial building construction -- which together with housing generates about 30 percent of U.S. demand for construction equipment -- provided manufacturers of small and medium-sized equipment some new business, but not enough to offset the drop in sales to housing contractors. Moreover, in a double blow to these producers, most types of private nonresidential construction slowed down in 1980 and again last year. The major exception to this trend was office-building construction, which continued to boom to the benefit of manufacturers of construction cranes.

The domestic market for large pieces of construction equipment -- bulldozers, scrapers, graders, rollers, wheel and crawler tractors and loaders and off-highway trucks -- generally topped out in 1979. Construction of highways, bridges, sewer and water-supply systems, schools and other public works, which account for roughly 40 percent of U.S. construction equipment sales, slowed significantly in 1980 and 1981 after registering selective increases in the late 1970s. Part of this slowdown reflected the virtual completion of the interstate highway system, the declining need for new schools and the impact of scaled-back housing starts on water and sewer requirements. The primary cause, however, was a cut in the federal budget, which directly or indirectly determines about two-thirds of all public-works spending, as well as a similar decline in state and local expenditures.

The other major U.S. market for large construction equipment is coal strip mining and other surface mining, including quarrying. Shipments to this market, which represents an estimated 30 percent of domestic construction equipment sales, remained good in the late 1970s and the first two years of the 1980s, but since the long-anticipated boom in coal mining has yet to materialize, mining companies did not pick up the slack in demand for large machines caused by the downturn in public-works activity.

With domestic business going downhill after 1978 or 1979, American construction equipment manufacturers turned to the substantial export market to cushion the slide at home. Largely because of Caterpillar's market position, the U.S. industry has always been the world's dominant supplier of construction equipment, especially large earth-moving and surface-excavation machinery. This leadership role was built in part on the high performance and reliability of American-made equipment and the continuing stream of design innovations incorporated in it. A well-financed worldwide dealer, service and parts-distribution network was instrumental too, particularly for Caterpillar, which some industry analysts say has the best dealer organization of any company in any industry. The large volume of business American construction companies do abroad also played a role in the success of U.S. exporters, since these contractors normally specify American-made equipment for their projects. In addition, U.S. manufacturers faced only a limited number of foreign competitors in a limited number of overseas markets.

These factors, plus the geographical diversity of export sales, stood U.S. makers in good stead in 1980. With shipments up to all regions but especially to the Middle East, Africa and Latin America, and with major export items like crawler tractors, wheel loaders and construction cranes selling particularly well abroad, export earnings expanded by an estimated 22 percent. This gain did not prevent the value and the volume of U.S.

output from declining in 1980. It did, however, mean the difference between just a disappointing year and a bad year for American manufacturers, as they shipped roughly 38 percent of their production abroad.

Exports provided an even larger margin of difference in 1981, when the export ratio reached approximately 43 percent. In fact, the estimated 13-percent increase that occurred in overseas deliveries was enough to offset the decline in domestic sales and slightly raise the total value of production. But this good news was tempered by two ominous developments. One was that unit shipments declined last year for the third year in a row. The other was that sales to key foreign markets like Europe, Canada and Asia fell, often sharply, in 1981, while exports to Latin America marked time.

Competition for Export Markets Intensifies

The economic slowdown experienced last year by most European nations and Canada as well as by many developing countries obviously affected the overseas marketing activities of U.S. construction equipment manufacturers. At the same time, though, 1981 was really the first year American exporters felt the full competitive thrust of their Japanese counterparts.

Japan's construction equipment manufacturers confronted many of the same problems in their home market in 1981 as U.S. makers did: housing starts at their lowest level in 14 years, curtailed private nonresidential construction activity and, most importantly, scaled-back funding of public-works projects. Given this depressed domestic market environment, Japanese builders, not surprisingly, redoubled their export efforts, which had succeeded in 1980 in lifting yen-calculated overseas sales by roughly 24 percent and thereby keeping the value of production on the increase.

The intensified emphasis on exports proved to be the Japanese industry's salvation last year as well. Foreign sales measured in yen expanded by an additional 21 percent or so and offset the impact of slumping domestic demand to such an extent that the value of output was off only marginally. Particularly for Komatsu, which accounts for perhaps half of total Japanese construction equipment exports, a jump of one-third in exports was the deciding factor between a sales increase and a sales decline in 1981 since its domestic sales fell by 5 percent.

Last year's overseas sales expansion, which boosted the export ratio from 1980's 31-percent level to 38.1 percent, was paced by stepped-up sales of both bulldozers/crawler tractors and hydraulic excavators -- the top export earners -- to the resilient Middle East market. Soaring sales of bulldozers/crawler tractors to the Soviet Union also swelled exports, as did larger deliveries of these machines to Latin America and Africa. What made 1981's export gain all the more impressive was that sales to Southeast Asia, Japanese makers' main overseas market, fell rather significantly, particularly for bulldozers/tractors but also for hydraulic excavators.

Japanese makers have parlayed several advantages to make inroads in overseas markets outside their Southeast Asian stronghold. Perhaps the key one, at least in their view, is that Japanese-made machines offer superior performance and surpass the competition's products in reliability, largely because of the extensive use of microprocessor and other electronics technologies. Lower production costs, the result in part of state-of-the-art manufacturing equipment, have also enhanced the international competitive strength of Japanese producers. Underpricing Caterpillar, the industry's worldwide price leader, has also been a factor, but a secondary one, according to manufacturers in Japan, particularly since Caterpillar and everyone else has resorted to discounting to counter the spreading slump in world demand.

Cracking the U.S. Market Proves Hard

These factors have turned Japanese construction equipment manufacturers, especially Komatsu, into formidable competitors of American companies in third markets. In many respects, though, Japan's exporters regard their ability to crack the American market as the real litmus test of international competitiveness. So far, only the top Japanese maker has passed the test, capturing perhaps 3 percent of the domestic earthmoving equipment market. In part, this is because Komatsu has had a U.S. marketing organization since 1970. The other major Japanese construction equipment companies now selling in the United States under their own brand names — Furukawa, Hitachi Construction Machinery, Japan Steel Works, Kawasaki Heavy Industries, Ltd., Kobe Steel and Mitsubishi Heavy Industries — did not begin marketing here until the late 1970s. Their entry generally coincided with 1978's steep appreciation in the value of the yen. More importantly, these companies came into the U.S. market just when domestic demand for most types of construction equipment was peaking.

The type of equipment Komatsu markets in the United States has also worked to its advantage. Its full lines of crawler tractors (14 models ranging from 63 horsepower up to 620 horsepower) and crawler loaders (seven models with bucket capacities from 1 cubic yard up to 5.9 cubic yards), as well as its recently introduced dump truck line, compete in comparatively healthy segments of the U.S. market. In contrast, the four Japanese makers selling hydraulic excavators in the United States — Hitachi Construction Machinery (eight models spanning a full range of bucket capacities), Japan Steel Works (six models, generally in the small bucket-capacity class), Kobe Steel (five small-capacity-class models) and Mitsubishi Heavy Industries (three models in the small-capacity class) — are trying to generate sales for a product that has never been used as extensively here as in Japan or Europe and at a time when even established American hydraulic-excavator makers are having sales problems. Moreover, the three Japanese companies marketing wheel loaders — Furukawa (three models), Kawasaki Heavy Industries (five models) and Kobe Steel (four models) — are fighting for sales in one of the most crowded and competitive parts of the business.

Construction Equipment Industry Goes into a Tailspin

Selling construction equipment in the United States this year has become considerably tougher for Japan's second-tier makers and for Komatsu too, since they are being forced to compete for a slice of a shrunken pie. Demand in all major end markets -- civil engineering, housing construction, industrial and commercial building and surface mining -- has skidded, a casualty of high interest rates, further cutbacks in public-works funding, the oil glut and the recession itself, and no alternative markets have developed to take up any of the slack.

By itself, the current slump in domestic demand would have been enough to send U.S. makers reeling, capping, as it does, two or three years of progressively softening business at home. But, in a double blow, the market for construction equipment has turned down in the Middle East, Africa and Australia and demand has contracted further in Europe, Canada, Latin America and Southeast Asia. According to industry analysts, this is the first time in twenty-five years or so that demand for construction equipment has been off in every major world market.

No American construction equipment producer has been spared. The most graphic demonstration of this fact is that Caterpillar, which posted record sales and earnings in 1981 while most other makers were faltering, is predicting its first yearly non-strike-related loss since the early 1930s. Deere & Co., thought to be the number-two U.S.

manufacturer but a distant second to Caterpillar, had an operating loss on its construction equipment sales in the year ending in October 1981 and is expected to announce another loss for the fiscal year just ended. With the industry generally operating at only one-third to one-half of capacity, other makers like Clark Equipment Co., Harnischfeger, Bucyrus-Erie and Tenneco Inc.'s J.I. Case unit are also predicting losses this year for their construction equipment businesses.

With most industry analysts and even some company executives not expecting a solid recovery in construction equipment sales until 1985 or 1986, changes in the structure of the U.S. industry might be in the offing. In fact, consolidation of operations has already started to occur. Just last week, International Harvester sold its construction equipment business to Dresser Industries Inc., which manufactures the Galion line of road-building machines. Two years ago, General Motors Corp. sold its Terex construction equipment subsidiary to IBH Holding AG, a West German conglomerate that is the world's third-largest maker of earthmoving equipment. Moreover, Allis-Chalmers Corp. is trying to pull out of its joint venture with Fiat, Fiatallis Inc., which operates one plant in the United States and two in Italy.

Caterpillar and, to a lesser extent, Deere are likely to be the main beneficiaries of any shake-out. They are already two of this country's strongest and best-run companies, and both continue to invest heavily in computer-aided engineering and manufacturing systems, robots and other production technologies that contribute to enhanced productivity and quality, as well as in new product development. In addition, the two have extremely strong sales networks, both here and abroad.

A shake-out among American construction equipment makers could also work to the benefit of Komatsu and perhaps some of Japan's other makers. Japanese producers as a group are weathering the slump in their own market and in the international market surprisingly well, mainly because the yen's steep drop in value since the start of the year has enabled them to capture much of what limited new business has developed in markets outside the United States. Through the first half of 1982, in fact, the number of Japanese-made machines shipped abroad was up significantly in almost all product lines. U.S. exporters, in contrast, saw their shipments drop across the board.

Despite rising exports, Japanese makers are not sanguine about the future because of the deepening slump at home. Least confident are the large number of companies turning out hydraulic excavators. Outside of Komatsu, Hitachi Construction Machinery and Mitsubishi Heavy Industries, the biggest producers, most of these manufacturers are reportedly operating in the red. Seven of them have already informally paired up to cut production costs. In addition, they as well as other manufacturers, including Komatsu, are trying to lessen dependence on construction equipment by diversifying into other fields.

For further information, contact Susan MacKnight.

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Table 1: U.S. Shipments of Selected Types of Construction Equipment, 1977-81

(value in thousands of dollars; quantity in units)

	1977	1978	1979	1980	1981
Value					
Hydraulic Excavators	$423,929	$553,731	$609,354	$474,826	$375,792
Mechanical Excavators	170,019	179,332	143,342	114,392	104,801
Draglines	349,626	416,028	385,120	297,131	182,104
Crawler-Mounted Mechanical Cranes	286,848	274,303	323,177	301,385	303,129
Truck-Mounted Mechanical Cranes	125,271	127,319	156,169	136,047	140,304
Hydraulic Cranes	427,636	546,755	666,736	700,037	846,380
Attachments and Parts for Excavators, Draglines and Cranes	439,870	529,911	518,070	626,909	650,380
Front-End Wheel Loaders	1,131,194	1,443,899	1,472,097	1,456,326	1,398,451
Front-End Crawler Loaders	219,565	284,999	287,677	240,764	207,019
Wheel Loaders/Backhoes	212,862	278,269	356,956	306,736	315,639
Contractors' Off-Highway Wheel Tractors	435,816	546,901	546,117	487,950	476,593
Crawler Tractors	1,136,297	1,404,331	1,322,150	1,306,144	1,569,905
Dozers, Backhoes and Other Attachments for Mounting on Prime Movers	457,803	580,418	664,950	618,802	662,162
Motor Graders	324,626	391,239	427,144	493,948	469,688
Self-Propelled Rollers	140,231	182,445	216,795	258,426	255,877
Scrapers	197,874	257,287	246,052	180,879	194,291
Self-Propelled Ditchers and Trenchers	85,134	127,493	127,797	105,934	118,395
Quantity					
Hydraulic Excavators	5,063	5,978	5,729	3,972	2,921
Mechanical Excavators	176	197	145	72	65
Draglines	34	50	73	77	43
Crawler-Mounted Mechanical Cranes	1,113	1,064	1,155	1,058	780
Truck-Mounted Mechanical Cranes	663	541	595	468	410
Hydraulic Cranes	4,956	5,982	8,376	8,527	9,146
Attachments and Parts for Excavators, Draglines and Cranes	n.a.	n.a.	n.a.	n.a.	n.a.
Front-End Wheel Loaders	36,628	41,815	48,137	41 040	30,083
Front-End Crawler Loaders	6,179	7,036	6,277	4,440	3,286
Wheel Loaders/Backhoes	20,204	21,704	23,028	17,602	15,481
Contractors' Off-Highway Wheel Tractors	8,984	9,242	8,267	6,895	5,664
Crawler Tractors	19,968	22,057	19,812	16,503	15,789
Dozers, Backhoes and Other Attachments for Mounting on Prime Movers	99,590	123,625	140,615	113,774	109,396
Motor Graders	6,706	7,372	7,257	7,165	5,947
Self-Propelled Rollers	9,537	10,534	11,096	10,111	7,253
Scrapers	4,915	4,420	4,075	2,571	2,403
Self-Propelled Ditchers and Trenchers	11,051	14,436	13,241	9,502	8,952

Source: U.S. Department of Commerce, Bureau of the Census, Current Industrial Reports: Construction Machinery (MA-35D)

Table 2: Total U.S. Exports of Selected Types of Construction Equipment, 1977-81

(value in thousands of dollars; quantity in units)

Value	1977	1978	1979	1980	1981
Hydraulic Excavators	$ 79,349	$ 87,480	$121,745	$163,125	$147,278
Mechanical Excavators	105,706	36,861	48,863	72,935	49,756
Draglines	n.a.	14,847	1,635	1,092	5,227
Crawler-Mounted Mechanical Cranes	n.a.	88,019	86,605	132,323	156,019
Truck-Mounted Mechanical Cranes	n.a.	83,175	73,975	77,631	114,198
Hydraulic Cranes	n.a.	243,280	302,871	378,097	425,959
Attachments and Parts for Excavators, Draglines and Cranes	n.a.	487,418	433,263	542,928	519,783
Front-End Wheel Loaders	373,158	347,560	461,418	659,431	644,353
Front-End Crawler Loaders	44,935	49,620	62,407	73,002	92,490
Wheel Loaders/Backhoes	n.a.	69,371	83,081	91,213	96,262
Contractors' Off-Highway Wheel Tractors	121,033	169,612	196,580	255,280	200,587
Crawler Tractors	491,200	566,279	650,848	774,550	956,734
Dozers, Backhoes and Other Attachments for Mounting on Prime Movers	57,688	72,706	90,654	107,106	136,828
Motor Graders	159,298	190,733	183,866	290,407	356,097
Self-Propelled Rollers	68,902	64,325	82,154	107,496	134,423
Scrapers	118,907	84,795	118,445	127,036	212,358
Self-Propelled Ditchers and Trenchers	18,770	26,065	39,097	41,403	37,010
Quantity					
Hydraulic Excavators	819	868	1,059	1,333	1,039
Mechanical Excavators	413	139	136	206	141
Draglines	n.a.	n.a.	4	4	2
Crawler-Mounted Mechanical Cranes	n.a.	333	290	312	300
Truck-Mounted Mechanical Cranes	n.a.	795	547	614	737
Hydraulic Cranes	n.a.	2,480	2,753	3,200	3,259
Attachments and Parts for Excavators, Draglines and Cranes	n.a.	n.a.	n.a.	n.a.	n.a.
Front-End Wheel Loaders	10,315	7,408	10,049	12,334	10,374
Front-End Crawler Loaders	957	1,007	1,117	1,211	1,422
Wheel Loaders/Backhoes	n.a.	3,345	3,505	3,824	3,498
Contractors' Off-Highway Wheel Tractors	2,761	2,345	2,546	2,824	1,859
Crawler Tractors	6,897	7,299	6,902	7,061	7,466
Dozers, Backhoes and Other Attachments for Mounting on Prime Movers	14,181	22,831	24,446	27,995	29,755
Motor Graders	3,170	3,898	3,550	4,581	4,565
Self-Propelled Rollers	2,890	2,044	2,483	2,700	3,144
Scrapers	1,431	1,227	2,002	1,799	1,890
Self-Propelled Ditchers and Trenchers	2,358	1,763	2,504	2,536	2,101

Source: U.S. Department of Commerce, U.S. Exports (FT 410)

Table 3: Total U.S. Imports of Selected Types of Construction Equipment, 1977-81

(value in thousands of dollars; quantity in units)

	1977	1978	1979	1980	1981
Value					
Backhoes, Excavators, Clamshells and Draglines	$ 7,636	$31,505	$20,081	$39,973	$28,518
Cranes	n.a.	8,119	10,275	2,173	5,953
Front-End Wheel Loaders	33,757	63,962	62,741	70,171	78,635
Front-End Crawler Loaders	13,540	74,291	46,508	37,606	31,721
Contractors' Off-Highway Wheel Tractors	n.a.	2,480	6,206	1,925	1,641
Crawler Tractors	3,854	5,875	1,933	1,949	2,636
Excavating, Leveling, Boring and Extracting Equipment	189,031	226,859	185,698	136,724	119,259
Parts and Attachments	199,260	284,351	322,461	352,761	542,344
Quantity					
Backhoes, Excavators, Clamshells and Draglines	760	737	1,743	632	798
Cranes	n.a.	133	132	44	93
Front-End Wheel Loaders	1,885	2,851	2,770	3,225	1,871
Front-End Crawler Loaders	539	2,141	1,390	957	625
Contractors' Off-Highway Wheel Tractors	n.a.	364	706	204	105
Crawler Tractors	136	170	64	99	85
Excavating, Leveling, Boring and Extracting Equipment	13,953	18,044	16,297	11,304	7,443
Parts and Attachments	n.a.	n.a.	n.a.	n.a.	n.a.

Source: U.S. Department of Commerce, U.S. Imports for Consumption and General Imports (FT 246)

Table 4: U.S. Imports of Selected Types of Construction Equipment from Japan, 1977-81

(value in thousands of dollars; quantity in units)

	1977	1978	1979	1980	1981
Value					
Backhoes, Excavators, Clamshells and Draglines	$ 1,474	$ 2,040	$ 2,285	$11,107	$ 7,498
Cranes	n.a.	91	0	0	0
Front-End Wheel Loaders	16,071	29,750	36,832	34,680	18,036
Front-End Crawler Loaders	7,233	56,526	35,210	27,561	24,956
Contractors' Off-Highway Wheel Tractors	n.a.	236	72	508	238
Crawler Tractors	3,433	5,726	986	568	204
Excavating, Leveling, Boring and Extracting Equipment	101,902	106,191	68,912	53,835	44,443
Parts and Attachments	45,797	74,895	77,158	61,209	84,340
Quantity					
Backhoes, Excavators, Clamshells and Draglines	355	114	187	312	230
Cranes	n.a.	7	0	0	0
Front-End Wheel Loaders	1,038	1,526	1,570	1,157	551
Front-End Crawler Loaders	327	1,696	1,173	791	452
Contractors' Off-Highway Wheel Tractors	n.a.	32	45	37	40
Crawler Tractors	95	153	30	12	4
Excavating, Leveling, Boring and Extracting Equipment	3,246	4,413	4,134	1,369	1,237
Parts and Attachments	n.a.	n.a.	n.a.	n.a.	n.a.

Source: U.S. Department of Commerce, U.S. Imports for Consumption and General Imports (FT 246)

Table 5: Japan's Production of Selected Types of Construction Equipment, 1977-81

(value in thousands of dollars*, quantity in units)

	1977	1978	1979	1980	1981
Value					
Hydraulic Excavators	$797,751	$1,617,996	$1,807,055	$1,863,152	$1,850,626
Mechanical Excavators	114,074	244,117	346,495	312,675	305,568
Truck-Mounted Mechanical Cranes	53,722	60,383	62,654	63,112	73,125
Truck-Mounted Hydraulic Cranes	223,828	365,406	463,891	525,201	529,065
Front-End Wheel Loaders	398,071	614,137	775,075	834,568	932,457
Front-End Crawler Loaders	178,157	256,325	222,050	196,022	139,403
Bulldozers	519,578	778,388	834,384	879,814	914,501
Graders and Scrapers	55,056	99,957	112,691	102,315	122,595
Rollers	36,535	86,010	102,606	108,728	125,678
Quantity					
Hydraulic Excavators	28,319	43,972	51,639	54,978	46,749
Mechanical Excavators	790	1,321	1,743	1,733	1,382
Truck-Mounted Mechanical Cranes	346	282	249	336	283
Truck-Mounted Hydraulic Cranes	4,502	5,577	7,129	7,720	7,331
Front-End Wheel Loaders	15,878	18,101	21,619	23,493	22,161
Front-End Crawler Loaders	7,485	8,327	7,829	6,455	3,931
Bulldozers	14,244	16,731	19,155	18,514	16,269
Graders and Scrapers	1,430	2,047	2,123	2,162	3,201
Rollers	17,671	22,214	37,166	55,274	47,935

*The following average annual exchange rates, which reflect the midpoint on the Tokyo spot foreign exchange market, were used to convert the yen production figures: 1977, ¥268.51; 1978, ¥210.44; 1979, ¥219.14; 1980, ¥226.74; and 1981, ¥220.54.

Source: Japan, Ministry of International Trade and Industry, Yearbook of Machinery Statistics

Table 6: Japan's Total Exports of Selected Types of Construction Equipment, 1977-81

(value in thousands of dollars*; quantity in units)

	1977	1978	1979	1980	1981
Value					
Hydraulic Excavators	$142,955	$259,397	$377,409	$500,111	$582,045
Mechanical Excavators					93,154
Truck-Mounted Cranes	n.a.	n.a.	n.a.	n.a.	233,942
Wheel Tractors	41,486	61,321	55,696	96,404	108,256
Bulldozers	40,347	38,980	60,037	116,477	179,384
Crawler Tractors	326,000	459,422	493,326	493,120	552,798
Crawler Tractor Parts and Accessories	84,732	112,420	141,445	157,767	174,916
Self-Propelled Graders	23,191	44,114	44,161	70,797	109,372
Self-Propelled Scrapers	6,933	11,208	19,120	11,372	15,840
Other Self-Propelled Leveling, Tamping and Extracting Machinery	189,928	211,956	240,501	290,237	311,538
Parts for Excavating, Leveling, Tamping and Extracting Machinery	58,329	79,774	93,277	104,467	160,244
Quantity					
Hydraulic Excavators	3,947	6,205	10,792	13,477	15,400
Mechanical Excavators					566
Truck-Mounted Cranes	n.a.	n.a.	n.a.	n.a.	2,968
Wheel Tractors	2,614	3,318	3,140	4,711	5,012
Bulldozers	1,537	1,159	1,518	2,395	2,497
Crawler Tractors	7,784	9,381	9,642	8,555	7,945
Crawler Tractor Parts and Accessories	n.a.	n.a.	n.a.	n.a.	n.a.
Self-Propelled Graders	674	1,063	1,085	1,819	2,345
Self-Propelled Scrapers	70	59	153	88	111
Other Self-Propelled Leveling, Tamping and Extracting Machinery	8,268	8,373	8,036	9,512	8,854
Parts for Excavating, Leveling, Tamping and Extracting Machinery	n.a.	n.a.	n.a.	n.a.	n.a.

*The following average annual exchange rates, calculated by the Ministry of Finance, were used to convert the yen export figures: 1977, ¥270.42; 1978, ¥212.18; 1979, ¥217.47; 1980, ¥227.67; and 1981, ¥219.90.

Source: Japan, Ministry of Finance, Japan Exports and Imports: Commodity by Country

Table 7: Japan's Total Imports of Selected Types of Construction Equipment, 1977-81

(value in thousands of dollars*; quantity in units)

	1977	1978	1979	1980	1981
Value					
Excavators	$1,921	$4,111	$3,863	$1,688	$2,111
Wheel Tractors	993	987	1,839	3,296	2,297
Bulldozers	32	685	909	56	1,223
Crawler Tractors	2,387	11,113	22,306	15,560	20,310
Crawler Tractor Parts and Accessories	3,743	5,865	7,037	6,337	8,755
Self-Propelled Graders	177	680	1,688	718	1,102
Self-Propelled Scrapers	0	101	4,038	5,507	5,348
Other Self-Propelled Excavating, Leveling, Tamping and Extracting Machinery	6,836	20,099	32,869	27,959	16,673
Parts for Excavating, Leveling, Tamping and Extracting Machinery	17,248	13,908	25,150	30,453	38,645
Quantity					
Excavators	180	151	80	29	10
Wheel Tractors	377	210	379	534	327
Bulldozers	2	8	14	2	13
Crawler Tractors	51	110	171	120	143
Crawler Tractor Parts and Accessories	n.a.	n.a.	n.a.	n.a.	n.a.
Self-Propelled Graders	2	11	19	7	11
Self-Propelled Scrapers	0	1	19	25	34
Other Self-Propelled Excavating, Leveling, Tamping and Extracting Machinery	125	204	266	247	135
Parts for Excavating, Leveling, Tamping and Extracting Machinery	n.a.	n.a.	n.a.	n.a.	n.a.

*The following average annual exchange rates, calculated by the Ministry of Finance, were used to convert the yen import figures: 1977, ¥270.53; 1978, ¥212.17; 1979, ¥217.46; 1980, ¥227.85; and 1981, ¥219.94.

Source: Japan, Ministry of Finance, Japan Exports and Imports: Commodity by Country